

## **Title: Fall Festival**

### **Brief Overview:**

This unit focuses on problem solving, data analysis, basic number sense, and written communications. Students are responsible for choosing the activities for the Fall Festival. The students will compare/contrast the cost of the activities from the previous year's Fall Festival. The students will determine seven activities that they think should be part of the Fall Festival. Then the students will design a survey for helping to select activities most desired by the rest of the student body. The students will create a frequency chart, line plot, and bar graph for every class representing the most popular choice of activities. Finally, using the interpreted data, the students will write a letter to the principal explaining which activities should be considered for the festival and why.

### **NCTM 2000 Principles for School Mathematics:**

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*
- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*
- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*
- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

### **Links to NCTM 2000 Standards:**

#### **• Content Standards**

##### **Number and Operations**

- *Understand numbers, ways of representing numbers, relationships among numbers, and number systems; understand the place-value structure of the base-ten number system and be able to represent and compare whole numbers and decimals; develop understanding of fractions as parts of unit wholes, as parts of a collection, as locations on number lines, and as divisions of whole numbers; and recognize and generate equivalent forms of commonly used fractions, decimals, and percents.*
- *Compute fluently and make reasonable estimates; develop fluency in adding, subtracting, multiplying, and dividing whole numbers; develop and use strategies to estimate the results of whole-number computations and to judge the reasonableness of such results; select appropriate methods and tools for computing with whole numbers from among mental computation, estimation, calculators, and paper and pencil according to the context and nature of the computation and use the selected method or tools.*

### **Algebra**

- *Understand patterns, relations, and functions; and represent and analyze patterns and functions, using words, tables, and graphs.*
- *Use mathematical models to represent and understand quantitative relationships; and model problem situations with objects and use representations such as graphs, tables, and equations to draw conclusions.*
- *Analyze change in various contexts; investigate how a change in one variable relates to a change in a second variable and affects precision; and explore what happens to measurements of a two-dimensional shape such as its perimeter and area when the shape is changed in some way.*

### **Data Analysis and Probability**

- *Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them; design investigations to address a question and consider how data-collection methods affect the nature of the data set; collect data using observations, surveys, and experiments; represent data using tables and graphs such as line plots, bar graphs, and line graphs; and recognize the differences in representing categorical and numerical data.*
- *Select and use appropriate statistical methods to analyze data; describe the shape and important features of a set of data and compare related data sets, with an emphasis on how the data are distributed; and compare different representations of the same data and evaluate how well each representation shows important aspects of the data.*
- *Develop and evaluate inferences and predictions that are based on data; and propose and justify conclusions and predictions that are based on data and design studies to further investigate the conclusions or predictions.*

### **Process Standards**

#### **Problem Solving**

- *Instructional programs from prekindergarten through grade 12 should enable all students to build new mathematical knowledge through problem solving; solve problems that arise in mathematics and in other contexts; apply and adapt a variety of appropriate strategies to solve problems; and monitor and reflect on the process of mathematical problem solving.*

#### **Reasoning and Proof**

- *Instructional programs from prekindergarten through grade 12 should enable all students to recognize reasoning and proof as fundamental aspects of mathematics; make and investigate mathematical conjectures; develop and evaluate mathematical arguments and proofs; and select and use various types of reasoning and methods of proof.*

#### **Communication**

- *Instructional programs from prekindergarten through grade 12 should enable all students to organize and consolidate their mathematical thinking through communication; use the language of mathematics to express mathematical ideas precisely; and analyze and evaluate the mathematical thinking and strategies of others.*

### **Connections**

- *Instructional programs from prekindergarten through grade 12 should enable all students to recognize and use connections among mathematical ideas; understand how mathematical ideas interconnect and build on one another to produce a coherent whole; communicate their mathematical thinking coherently and clearly to peers, teachers, and others; and recognize and apply mathematics in contexts outside of mathematics.*

### **Representation**

- *Instructional programs from prekindergarten through grade 12 should enable all students to create and use representations to organize, record, and communicate mathematical ideas; select, apply, and translate among mathematical representations to solve problems; and use representations to model and interpret physical, social, and mathematical phenomena.*

### **Grade/Level:**

Grades 4-5

### **Duration/Length:**

Four days

### **Prerequisite Knowledge:**

Students should have working knowledge of the following skills:

- Adding/subtracting amounts of money
- Understanding line plots, line graphs, bar graphs, and frequency charts
- Knowing the parts of a letter
- Knowing how to write a letter to inform

### **Student Outcomes:**

Students will:

- design and conduct a survey.
- construct a line plot.
- count and record data on a frequency chart.
- design an appropriate graph to visually represent information.
- interpret the results on the graph.
- write a letter to inform principal of suggestions for the school's Fall Festival.

### **Materials/Resources/Printed Materials:**

- Clipboards
- Rulers
- Pencils, markers, or colored pencils
- Surveys
- Graph paper
- Post it notes
- Calculators (optional)
- Vignette (overhead),
- Student Resource Sheets #1-6

- Acorns
- Teacher Resource Sheets #1 and #2
- Graphic Organizer (teacher's choice)
- Template from MSWord (optional)

## **Development/Procedures:**

### **Background:**

These activities assume that students know about types of graphs, how to interpret data, and how to write a letter to inform. Teacher will model how to construct and conduct a survey and record results on a frequency table.

### **Day One**

1. The teacher will put a frequency chart on the board for the amount of acorns that students can hold in their hands. Students will place a post-it note of the number of acorns in the appropriate place on a frequency table.
2. Ask students how information could be displayed more clearly.
3. Using the post -it notes, the teacher will assist the class in making a line plot by moving the post-it notes on to the line plot.
4. Review and interpret information acquired from the brief survey.
5. Create a bar graph representing the average for each group of students.
6. Introduce the vignette (overhead). Review names and costs of activities (SR#1).
8. Each group of 4 - 5 students will brainstorm and decide which activities should be eliminated from the list of activities.
9. As a whole group share results and create the survey to be conducted.

### **Day Two**

1. Students will use SR#1, so students can create a frequency chart for collecting data on SR#2.
2. Students will be paired and assigned a classroom in the school to survey.
3. Students leave to collect data.
4. Begin classroom discussion of students' experiences with the survey. The students can share what they liked/disliked about giving the survey.
5. Students will determine how they are going to use all the information that they gathered.

### **Day Three**

1. Provide each pair of students with all the data collected.
2. Discuss to determine what to do with the data that is spread over several pages.
3. Demonstrate how to add data from other pairs with their own data. (Provide the students with calculators.) (optional)
4. Discuss what the students should do with all the sums.
5. Have the students create a frequency chart.(SR#2)
6. Give the student a choice to create a line graph or bar graph to display information. (Students should know that they will need to create a bar graph. The line graph is inappropriate for the collected data.)
7. Spend remaining time interpreting and sharing the data they compiled with each other. What did the students' discover?
8. Have the students answer some brief questions to reflect on what they are doing.

**Day Four**

1. Review students' results and interpretation of bar graphs.
2. Share vignette.
3. Identify the FAT-P/ TAP F. (Form, topic, audience, and purpose)
4. Students are to be given a teacher-chosen graphic organizer to organize their ideas.
5. Student should be given time to write letters to the principal. (SR#4, or MSWord Template)
6. Optional: Sharing of letter- listening for math vocabulary related to math.

**Performance Assessment:**

Student learning will be assessed throughout the daily tasks and scored using rubrics in Teacher Resources #1 and 2. In addition to the final products like graphs and letters, student performance will be evaluated for behavior and cooperative learning.

Extension activities including constructing of pictographs, written explanations of graphs, and teacher made activities involving fractions, decimals, and percentages can be scored by established grade level expectations.

**Extension/Follow-Up:**

Students can use data from their frequency chart/bar graphs to construct pictographs. Students can use the data to create fractions, decimals and percentages. (SR#3) Students can share in discussion of what possibilities could happen if one or more variables were changed. (for example: what would happen if the prices for each activity were different or the amount of money available was different.)

**Authors:**

Carole Nalley  
Linthicum Elementary School  
Anne Arundel County, MD

Desiree Cook  
George D. Lisby/Hilldale Elementary School  
Harford County, MD

## Vignette #1

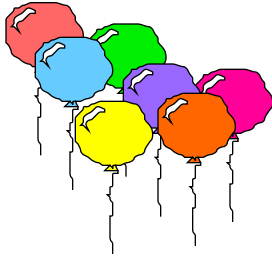
Every year the school has a Fall Festival for the students to attend. This year the school does not have as much money as the year before. The PTA was unable to contribute to the Fest because they had already appropriated their money to other activities. The principal has decided that our class should decide what activities should be included in the Fall Festival. The principal has given our class the names and the cost of each activity used in the prior years. Your task is to use your problem solving skills to identify five activities the school can afford and the student body will enjoy for the festival. The budget is \$400 and \$150 of the budget is designated for prizes. With the remaining money the class should decide on 7 out of 10 activities to place on the survey.

You will:

- design and conduct a survey of the student population.
- create a visual representation of the data.
- interpret the data.
- write a letter to the principal suggesting the 5 activities that should be included in the festival.

Before writing your letter to the principal, examine the data and the graph to decide what activities you should suggest. Complete the graphic organizer prior to writing your letter. Be sure to include support for each activity suggested from the data and the graph. Then write the letter in a final draft to your principal.

## Student Resource #1



<u>Activities</u>	<u>Cost</u>
Moon Bounce	\$61. 00
Face Painting	\$65. 00
Pony Ri des	\$85. 00
Constructing Scarecrow Booth	\$78. 00
Water Balloon Toss*	\$30. 00
Sand Art Booth	\$47. 00
Football Throw*	\$17. 00
Sack Race*	\$13. 00
Pottery Booth	\$56. 00
Scooter Races*	\$35. 00

\* These activities will need prizes.

# FALL FESTIVAL SURVEY DATA

[illegible]



Extension Activity

	Fall Festival Survey Data				
Name of Activity	Tally Marks	Frequency	Fractions	Percentages	Decimals
Total					

Student Resource #4

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### Rubric for Bar Graph

- 4 = Bar graph is complete & includes the following: Title, axis labels, Straight/ruled lines, equal interval numbers or spaces, numbered lines (not spaces), accurate data placement, appropriate units of measurement, and an accurate scale.
- 3 = Bar graph is almost complete but missing 1 - 2 of the following elements: Title, axis labels, straight/ruled lines, equal interval numbers or space, numbered lines (not spaces), accurate data placement, accurate key, appropriate units of measurement, and an accurate scale.
- 2 = Bar graph is incomplete or missing 3- 5 of the following elements: Title, axis labels, straight/ruled lines, equal interval numbers or space, numbered lines (not spaces), accurate data placement, accurate key, appropriate units of measurement, and an accurate scale.
- 1 = Bar graph is missing more than 5 of the following elements: Title, axis labels, straight/ruled lines, equal interval numbers or space, numbered lines (not spaces), accurate data placement, accurate key, appropriate units of measurement, and an accurate scale or the inappropriate graph for the type of collected data.

Rubric for Letter to the Principal

- 3 = The letter contains all of the five parts of a friendly letter, which include the date, greeting, body, closing, and signature. The letter has a topic sentence that clearly states what the letter is about. The five activities that the student body of the school wants at the Fall Festival are identified with supporting details from the bar graph and/or frequency chart.
- 2 = The letter is missing 1-2 of the five parts of a friendly letter, which include the date, greeting, body, closing, and signature. The letter is missing one of the following: a clear topic sentence that states what the letter is about, all of the activities the student body wants are not identified, or the five activities are identified, but not supported with data from the bar graph and/or frequency chart.
- 1 = The letter is missing 2- 4 of the five parts of a friendly letter, which include the date, greeting, body, closing, and signature. The letter does not have a clear topic sentence, identified the five activities, or has little to no support from the bar graph and/or frequency chart.